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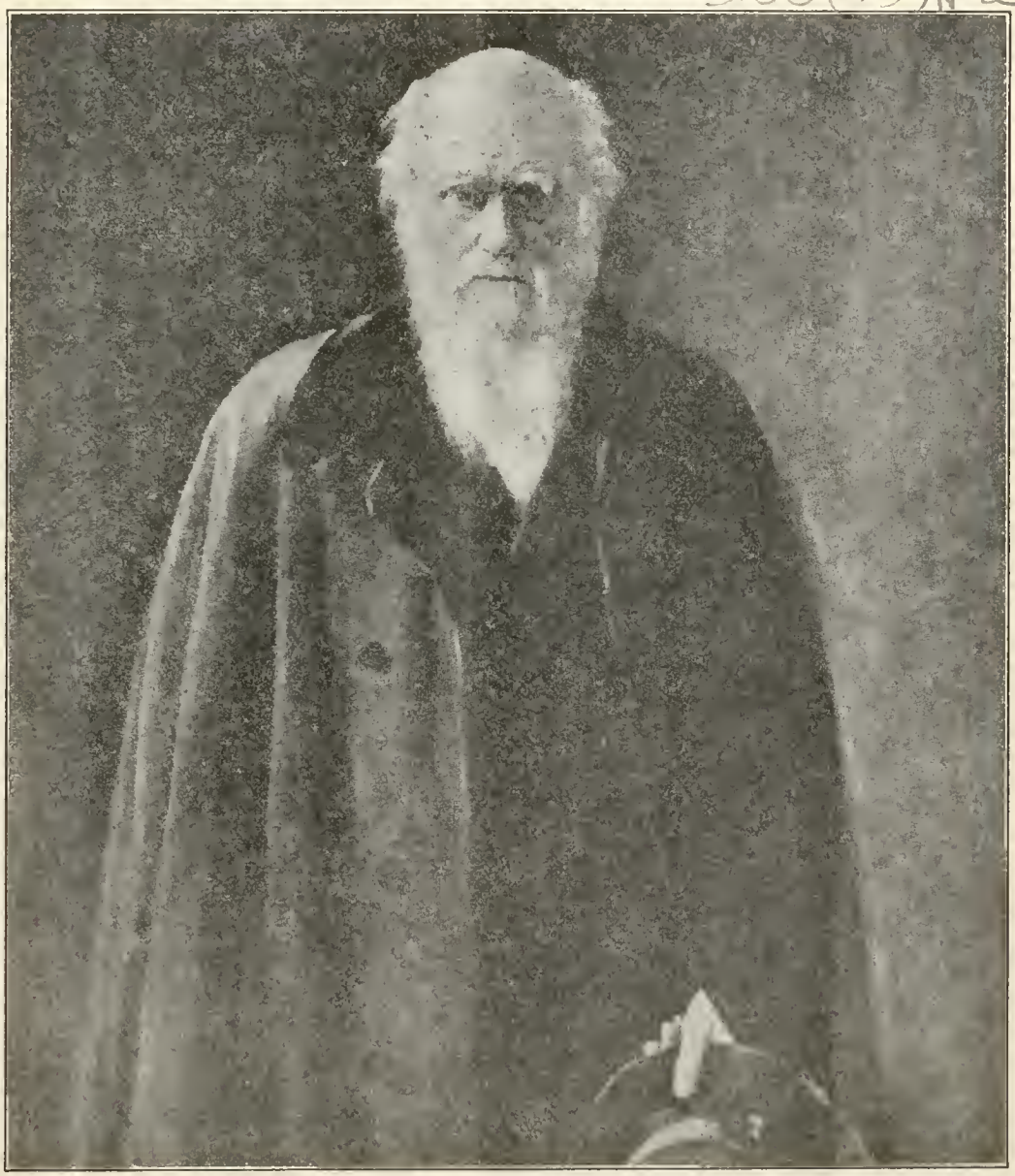

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THE GREAT EMANCIPATOR OF THE HUMAN INTELLECT

CHARLES DARWIN Born February 12, 1809

How Charles Darwin and Alfred A. Wallace Discovered Evolution

By Alexander Goldenweiser

On the 18th of June, 1858, Charles Darwin received a letter from Alfred Russell Wallace, then naturalizing in far-away lands. The letter contained a paper by Wallace "On the Tendency of Varieties to Depart Indefinitely from the Original Type." On the same day Darwin wrote to his friend Lyell, the geologist, expressing the fear that he, Darwin, had been "forestalled".

The fact of the matter was that Darwin himself had for years been interested in the problem the solution of which had come to Wallace in a moment's "flash of insight". And Wallace's flash corresponded to Darwin's own—he also had thought of "natural selection" as the process by means of which new species arose.

Now Darwin was in a quandary. He hesitated to publish, fearing unfairness to Wallace, but he was not indifferent to the prestige and fame which his own findings deserved and were certain to earn. Finally he was prevailed upon by his frinds, Lyell, Hooker, the botanist, and Huxley, the biologist, to have both papers presented at a meeting of the Linnaean Society. On July 1st, 1858, a report was read to the Society by its Secretary consisting of Wallace's paper, an extract from Darwin's sketch written in 1844—thus definitely establishing his priority—and part of Darwin's letter to Asa Grey, the naturalist, written in 1857.

The theory of natural selection was launched on its path which was to prove thorny but ultimately triumphant. Darwin went to work at once on his book which was finally offered to the public on November 24th, 1859, under the title "The Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life". The full data embodying the results of Darwin's painstaking investigations were not published until eight years later (1868) in his two volume work on "The Variation of Animals and Plants under Domestication". Finally in 1871 Darwin followed this up with his "Descent of Man" in which the argument, heretofore including only the lower animals, was extended to man.

What then was this theory of natural selection, arrived at independently by two scientists, one working with wild nature, the other inspired by the same observations but experimenting subsequently with domesticated breeds?

The initial observation made by Wallace and Darwin was this: They found that species of animals or birds placed by nature in spots of relative isolation, such as islands, while preserving enough similarity to their continental relatives to make their original identity recognizable, varied in different directions thus developing new species. This discovery, certain as a fact but so far inexplicable, disposed of the then prevailing idea of the immutability of species, an idea supported by scientific authority and strongly entrenched in theological dogma.

Both Darwin and Wallace were now certain of the fact of variation. It remained to discover a mechanism by means of which it could be explained. Darwin's approach was through controlled experimentation, notably with pigeons. By interbreeding slight variants in size, form or coloration, he succeeded in producing a large variety of new forms, which, when subsequently mated with individuals of the same peculiarities, proved to breed true, that is to preserve the recently acquired traits. Here Darwin was the selecting agency. The problem remained unsolved so long as no corresponding principle was found which would operate with similar results in nature.

While continuing his experiments and pondering over the results Darwin received a hint from Malthus' famous essay "On Population" in which Malthus argues that whereas population increased in a geometrical ratio, food supply increased in an arithmetical ratio. A situation was therefore found to arise in which not enough food would be available for all the hungry mouths.

In applying this notion to the conditions found in wild nature Darwin finally hit upon the idea that wild life in nature was to be thought of as a struggle—a struggle for life, for substance—in which those in some way better adjusted to their environment—"the fittest", the "favored races"—survived, lived longer, left more progeny among whom the traits of size, shape, color, etc., which had favored the parent animals were likely to be represented to the same or even greater extent. The others—the less favored ones—having briefer lives and leaving fewer offspring, ultimately died out.

In this way it came about, for example, that arctic bears, foxes, or hares developed white coloration which was foreign to their ancestors, that the Bengal tiger who lived in tall grass wears stripes—a protective device decreasing his visibility—, that the predatory cats—the tiger, leopard, jaguar, panther, wild cat,—have sharp powerful incisors, long fine disappearing claws, and can see at night, that numerous insects are in color or in shape so much like the grass, bark, branch, they live in or on as to be practically invisible, and so on and on through the entire range of animal kingdom.

It must be noted here that the theory of natural selection took such initial variations for granted and then attempted to account for their propagation by the purely external process of selective survival. But whence the variations? And how account for their inheritance and enhancement? The problem of initial variations Darwin never solved; with the problem of heredity he dealt in his theory of Pangenesis.

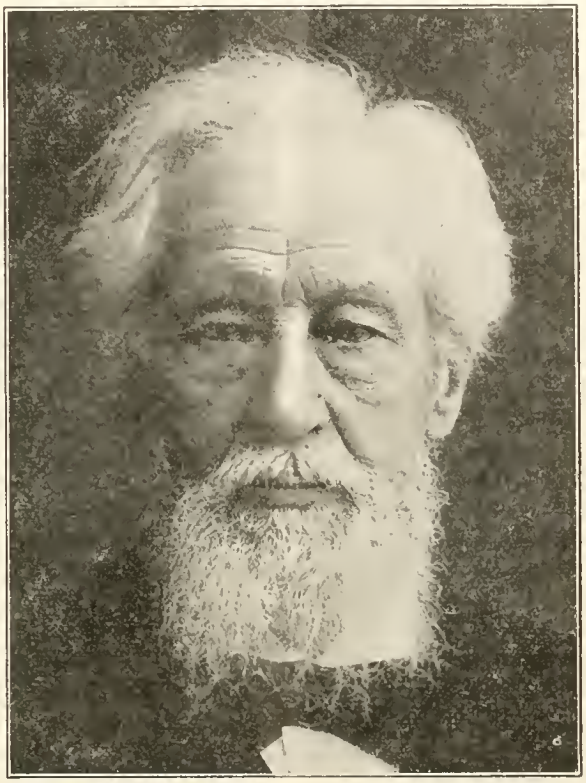
Of this theory, of the reception accorded the hypothesis of natural selection and of the valiant battles fought in its name by Darwin's friend, Thomas H. Huxley, I shall write in the next issue.

Eightieth Anniversary of Hugo De Vries

By J. C. Th. Uphof

On the sixteenth of February the eightieth birthday anniversary of one of our greatest and most active biologists, Hugo De Vries, will be celebrated throughout the civilized world.

De Vries was born February 16th 1848 in Haarlem, Netherlands. The study of botany attracted him at an early age. He studied at the University of Leiden and became greatly interested in work on plant physiology. Later he conducted researches in the laboratory of Julius Sachs in Wurzburg, Germany, which made him widely known in the botanical world. He became intensely interested in the origin of species, especially among plants.



Hugo De Vries

In Darwin's day it was supposed, not as a certainty but just as a hypothesis, that new species originated gradually with but very slight changes. Dr. Hugo De Vries, then a professor of botany at the University of Amsterdam, was one of many scientists who endeavored to solve by experiment the problem of how new species originated.

In 1885 when botanizing not far from Hilversum near Amsterdam, he found in a neglected field many specimens of a well known evening primrose, *Oenothera Lamarckiana*. Among them he discovered some heretofore unknown species that had escaped the botanists.

De Vries gathered seeds of *O. Lamarckiana* and also of the new forms. They were sown in the experimental section of the botanical garden in Amsterdam. These unknown species came true from seed. But to his surprise De Vries found also that some new species occurred among the thousands of plants of *O. Lamarckiana*. Some were the same as those that he had found wild, but there were also novel ones. These species originated from the mother plant, so to speak, with a leap or mutation. Upon this De Vries built his Mutation Theory.

Later other investigators strengthened this Theory of Mutations by demonstrating the occurrence of such sudden variations among other plants and animals.

Hugo De Vries' name is also widely known in connection with the Law of Mendel, which has taken such a prominent place in the study of genetics and the origin of species. De Vries' book "Die Mutationstheorie" which was published at the beginning of this century attracted world-wide attention and will be important for all time.

Although Hugo De Vries retired as professor of botany from the University of Amsterdam on his seventieth birthday he still shows great interest in his work which is continuously proven by his many publications. He still conducts zealously his researches in the laboratory and experimental garden on his estate in Lunteren in Gelderland province, Netherlands.

Through his enormous energy and love for science Hugo De Vries laid the basis of genetics, namely the study of heredity and of variations, which forms the foundation of our biological sciences, of eugenics and last but not least of plant and animal breeding. Hugo De Vries, who made such brilliant discoveries and far reaching conclusions and who has thrown so much light upon experimental evolution may therefore with all respect be called the successor of Charles Darwin.

We all join his many students of the Universities of Amsterdam and of California, where he lectured for some time, and the people of the Netherlands by whom he is greatly beloved, in wishing Hugo De Vries in his own native tongue a "Nog vele gelukkige en voorspoedige jaren sij U toegewenscht."

Patch of Evening Primrose in Holland, where De Vries discovered mutation, showing mutant in foreground.

Science Bridges Gaps in Evolution of Man

By Barrow Lyons

SINCE John T. Scopes stood before a jury of his peers two years ago in the famous trial at Dayton, Tenn., science has unearthed a large amount of new evidence which reinforces the argument in favor of the Darwinian view of evolution—that man and the modern man-like apes sprang from a common ancestral stock.

Nothing has been brought to light, however, which traces the line of descent more clearly than the study of teeth made by Dr. William K. Gregory and Dr. Milo Hellman of the American Museum of Natural History.

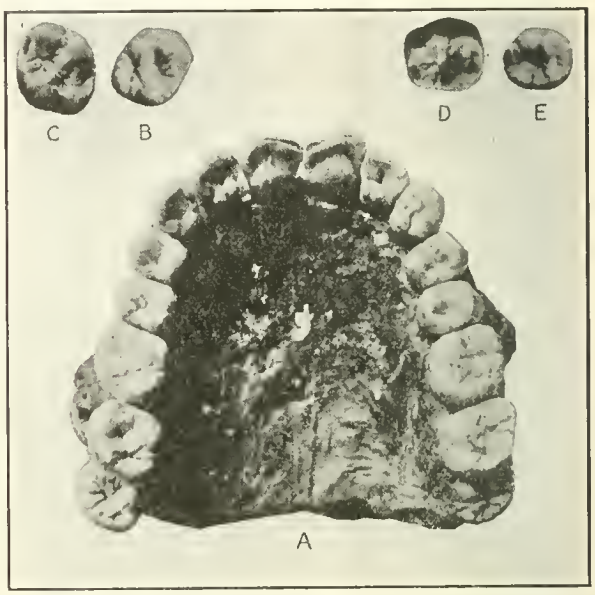
The evidence consists of fossil remains of apes and prehistoric men, teeth and bones of existing primitive types and similar records of the most highly civilized men. Teeth time and again have been the key in tracing the development of species. They are harder than other portions of the body and preserve the intricate patterns which trace the growth and adaptation of animals to their environment, often revealing habits of living which no other portions of the fossils divulge.

The patterns upon the grinding teeth in the American Museum collection of apes and men illustrate the development of the human species from its ape ancestors just as clearly as fossil remains show the development of the modern elephant with the multiple folds in its grinding teeth, from the African predecessors of the mastodon, which had but two or three ridges on its molars. They show man's marvelous change from a forest creature into a cultured, social being as clearly as another fossil group shows the development of the modern horse from a creature about the size of a fox, which ran over the open plains millions of years ago.

While the chain of evidence goes back further than the point at which the split between the apes and man apparently occurred, the immediate ancestor of each branch seems to have been a widely scattered fossil form found both in Europe and Asia. It is quite possible that none of the actual fossils that have been found were of the species from which modern forms descended. There undoubtedly were many more species at one time than we have records of, and some of these which have left no trace may have been the actual ancestors.

Yet, it may very well be that *Dryopithecus rhenanus*, found in the Miocene deposits of Germany, may have been our own particular ancestor for the resemblances to prehistoric man are, in some respects, very striking. The Miocene deposits in which they were found date back some 2,000,000 years.

Next come the Piltdown fragments found in England in the lower Pleistocene, or early glacial period of more

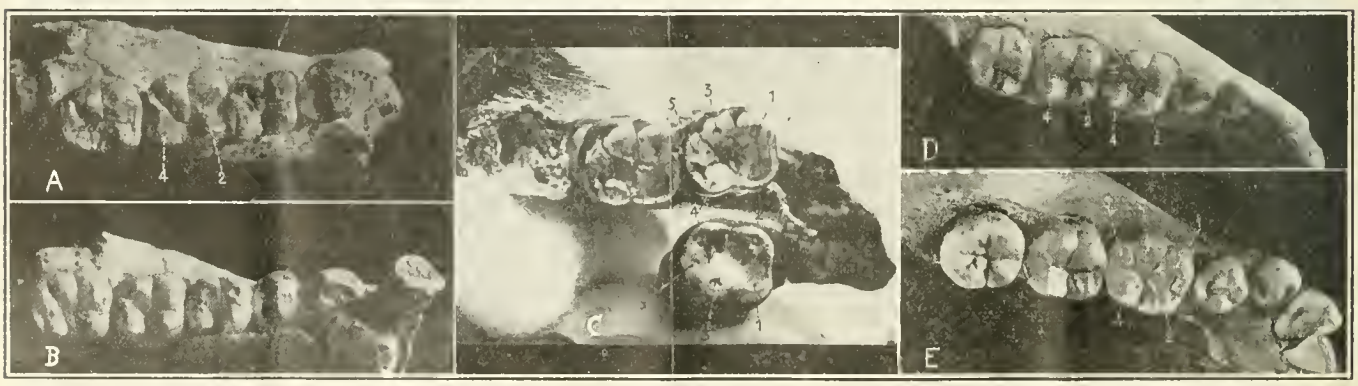


A. Palate of fossil Neanderthal man (Le Moustier); B. Second upper molar of Le Moustier; C. Second upper molar of fossil ape Dryopithecus; D. Lower molar of Dryopithecus; E. Ehringsdorf Child.

than 500,000 years ago. Then the Heidelberg man of the first inter-glacial period about 350,000 years ago. Then in succession the Ehringsdorf man of early Neanderthal times, 50,000 years back; the Mousterian youth of the later Neanderthal period, perhaps 30,000 years ago; Cro-magnon man of 20,000 years ago and then the Neolithic men of about 15,000 years ago.

The latter were more advanced than some of the primitive races today, like the Australian bushmen, and were the early representatives of modern, European man.

The evidence which Drs. Gregory and Hellman have presented is based largely upon an examination of first and second molars and first and second premolars, or



Lower Grinding Teeth of the Left Side.—A. B. Fossil Dryopithecus jaws from India; C. Fossil from Piltdown, England (Dawnman); D. Modern White; E. Modern India.

bicuspids. Yet, underlying the study of structure of these teeth is the fact that the whole dental formula is identical in all the forms examined, from Dryopithecus to modern man—two incisors, one canine tooth, two premolars and three molars on each side and in upper and lower jaws. Likewise, the dental formula for the milk teeth in all human races, all anthropoid apes and fossil monkeys is identical.

An amazing observation in connection with these teeth is that the crown patterns on the teeth of prehistoric men and some of the primitive living tribes are nearer the crown patterns found upon the fossil teeth of great-grand-uncle Dryopithecus than upon the teeth of civilized man. So far as teeth go, the Australian bushmen, some of the remote African tribes and certain Indian tribes are nearer the Old World apes than to you and me.

Considering the structure of teeth the gaps in the chain of evidence are closed. There are no "missing links".

How Man Differs From The Ape

By Bernhard J. Stern

I. ANATOMICALLY

In 1860, when the Darwinian controversy was being fought out in England, Thomas Huxley was asked by Wilberforce, the Bishop of Oxford, whether "it was thru his grandfather or his grandmother that he claimed his descent from a monkey." Huxley's mordant answer is now a classic: "I have asserted and I repeat that a man has no reason to be ashamed of having an ape for his grandfather. If there was an ancestor I should feel ashamed of recalling, it would be rather a man, a man of restless and versatile intellect, who not content with success in his own sphere of activity, plunges into scientific questions with which he has no real acquaintance, only to obscure them with aimless rhetoric, and to distract the attention of his hearers from the real point at issue by eloquent digressions and skilled appeals to religious prejudice!"

Were Huxley living today when we know more about the relation between man and the apes, he would have been all the more emphatic in his assertion that man has no reason to be ashamed of having an ape for an ancestor, or rather a relative. Man in his eagerness to rationalize his own futility, and to compensate for his own shortcomings, usually exaggerates the differences between himself and his next of kin to the disadvantage of the apes. In two articles, we shall analyze these differences, devoting this article to anatomical differences and the second to psychological differences.

Much romantic nonsense has been written about the importance of the structural differences between man and apes. Drummond, for example, speaks of man alone as having the ability to appreciate divinity because his posture permits him to raise his eyes from the ground to look heavenward. We shall resist phantasy and devote our attention to actual observable differences.

Look at your hand. Move your thumb. Notice that it can be swung toward or from any other finger; it is "opposable" as anatomists say. This makes the hand effective in holding and using tools. The thumb of an anthropoid ape is much shorter than the human thumb and it cannot be moved toward and from the other digits. An ape therefore, finds it difficult, sometimes impossible, to pick up a pin between his thumb and forefinger. When he drops to the ground he walks on his knuckles and his toelike thumb is useless.

Gregory, Keith and McGregor point out, however, that this difference is functional rather than structural. There are exactly the same number of fingers, exactly the same number of bones in each finger, and the bones are positioned in the same way. Even the fingers of the hand move in the same way. Wiggle your fingers separately and in pairs and you will observe that III and IV are paired and set off against II and V. Notice how much easier it is to move III and IV together than II and III. The tendons are arranged in the same manner in the chimpanzee where the same pairing is found as in the human hand. Furthermore, the embryologist, Schultz, has shown that in the human embryo the thumb is not opposable but is like that of a gorilla or chimpanzee, a thumb that must become rotated to become human.

Man's big toe, which is a powerful lever on which the whole body can be raised and which is therefore a mechanical device for walking, is distinctively human, for the big toe of the ape is not a toe at all but rather a thumb. To convert the foot of a gorilla into that of a man, Dr. Gregory has shown that the big toe must be extended and rotated so that it rests flat on the ground instead of facing the other toes. The bones of the toes must be shortened and made to lie parallel so that the foot is narrowed, and the foot must be turned to lie down rather than in. Schultz has shown that this is exactly what happens to the foot of the human embryo in the course of its development.

The difference between the brain of the anthropoid and of man has been much discussed but recently Professor Tilney has contended that the brain of the gorilla is manlike in all fundamentals, and Dr. Smith has said "No structure found in the brain of an ape is lacking in the human brain, and on the other hand the human brain reveals no formation of any sort that is not present in the brain of the gorilla or chimpanzee. So far as we can judge, the only distinctive feature of the human brain is a quantitative one, namely a marked increase in the extent of three areas in the cerebral cortex . . . which are relatively smaller in the brain of the anthropoid apes." When it is realized that both literally and figuratively man uses only a very small fraction of his brain matter, it will be recognized that this difference is not as important as is commonly assumed.

Next month: How Man Differs from the Ape: Psychologically.

What Can Children Inherit?

By HENSHAW WARD

THE student of heredity will tell you that no abuse of body or mind can be inherited, and that no good training of body or mind can be inherited. He would go so far as to say that the following imaginary case illustrates the truth: "Take a pair of infants (a boy and a girl) to a wilderness and bring them up without any education of body or mind; take another pair of infants who have inherited the same qualities as the first pair and give them every advantage of good breeding; let each pair mate and produce a son; the son born in the wilderness will have as much ability as the son born in fortunate surroundings.

I am not saying that this imaginary case represents the whole truth, nor that all biologists are agreed as to what the truth is. I am just giving an example to show picturesquely the two elements of life that biologists dispute about—(1) the germ-cell by which qualities are transmitted to children; (2) the bodily and mental changes produced in a person after he is born. All the influences that act upon a person (such as climate, food, training, accidents) are called the "environment." The effects of the environment upon an idividual, (for example, loss of a finger, skill in using a revolver, a morphine habit) are called "acquired characters." The great debate in biology for the past seventy years has been on the question: Can acquired characters be inherited? During these seventy years the opinion of scholars has steadily grown stronger that acquired characters cannot be inherited.

This judgment of science seems harsh to conscientious parents. It seems wicked to some hopeful social reformers, because it seems to say, "No matter how much you improve the surroundings and education of this generation, none of the improvement can be inherited by the next generation." It seems to say that heredity is everything and environment nothing, so that men are born to a certain condition in life. It seems to favor a caste system where those unfortunately born cannot rise. Hence it is disliked. People are always eager for proof that acquired characters *can* be inherited.

There are still a few of these bringers of glad tidings in the laboratories. Though the vote of biologists is a very heavy majority against them, the decision is not unanimous. And recently some of the leading students of heredity have been telling us that we don't know what "environment" means or how environment may effect germ-cells or how characters are formed in germ-cells. Only the other day a biologist declared to me, "Within the last three years I have entirely revised my notion of what the genes are." Hence the layman who wants to read about heredity may find two noted scientists seeming to dispute one another, and so may give up in confusion.

I will try to show that the confusion is mostly a matter of words. Biologists are not really at loggerheads about the main points at issue, nor do their revised notions of the genes give them very different conceptions of what children can inherit. They are pretty well agreed on a theory of inheritance, and a layman can understand what it is.

If you wish knowledge, you must, in the first place, put out of your mind all anger. A man who wants to uplift society or improve his children cannot succeed by ramming his emotions against the hard facts of biology.

You must, in the second place, read a description of the way every individual begins his life by the union of two cells.* (The best brief account that I know of is Chapter XVI of L. L. Woodruff's "Foundations of Biology.") In this short article there is only room to name the facts, without giving any explanation.

The egg (a cell 1/200 of an inch in diameter) contains within itself, potentially, all the elements for the making of an entire human being. The sperm (a cell only 1/8000 of an inch in diameter) also contains all the elements of an entire person. But neither cell can develop alone. A new human life does not begin until the sperm has penetrated the egg. Then the elements from the mother and the father are mingled in one cell; this divides into two cells: each of these two cells divides into two others; and so, as the embryo develops, the cells increase in number until there are millions of them. All the while the embryo lives as a kind of parasite within the mother, having its own system of blood-circulation. The number of cells increases to billions. There are trillions of them at birth.

Thus every one of us began life as a very small and infinitely complex organism, which contained the characters inherited from the father and mother. If the environment can ever affect heredity, it must manage somehow to penetrate a parent's body and alter the germ-cell in some definite *corresponding* way. The more familiar science becomes with the powers of germ-cells, the more difficult it is to imagine a way in which an environment could get at them.

No biologist believes nowadays that any effect of the environment on a woman's body or mind can enter into an embryo and produce a *corresponding* alteration that can enter into the inheritance of her children. For example, if she is frightened by a bear or a bright light, her child will not have claws or a white spot on its body. If a hundred successive generations of Chinese mothers bind their feet, or a hundred generations of Jewish boys are circumcised, no effect of these long-continued bodily changes is ever inherited.

During the past thirty years the biologists have been steadily abandoning the supposed cases of the inheritances of acquired characters. It is not likely that any student of germ-cells now believes that skill in penmanship can penetrate an egg and be born in a child. No amount of training for the mile run can cause a sperm to build larger muscles in an embryo. No amount of education in religion or logarithms or atheism or burglary can enter into a germ-cell and build more mathematical or burglarious brains. The possible cases of inherited effects of training are very few and not well accredited.

Now that we have seen the field where practically all scholars are unanimous in their opinion, we are prepared to look at the edge of the field, at the boundary where the battles of conflicting opinion rage. I can illustrate what all the battles are about by citing three extreme statements of eminent professors. In each one you will see that the man has encountered a flood of ignorance and foolishness, that he has done good by scornfully exposing folly, but that, for the sake of making his point, he has gone further than the whole truth warrants.

1. There is much folly talked by educated people about the inheritance of ways of behaving. They assume that gentlemanly conduct or vicious habits of life are inherited. But John B. Watson of Columbia finds no shred of evidence that any such inheritance of conduct is possible. Conduct, he finds, is a matter of the training that an individual receives. Therefore Watson makes the extreme statement:

> We have no real evidence of the inheritance of mental traits . . . I would feel perfectly confident in the ultimately favorable outcome of careful upbringing of a *healthy well-formed* baby born of a long line of crooks, murderers and thieves, and prostitutes. . . . Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in, and I'll guarantee to take any one at random and train him to become any type of specialist I might select—into a doctor, lawyer, artist, merchant, chief.

Watson's extraordinary claim can never be proved or disproved, because he cannot have his own specified world in which to experiment. He has doubtless stated a fifty per cent truth, for it seems likely that criminals and business men are largely shaped by their environment, and not by inheritance of mental traits. But most psychologists and biologists are compelled to believe that many persons are born with such mental equipment that they could never be great musicians or artists.

2. The most important idea in twentieth-century study of heredity has been "Mendelism," the theory of the way in which bodily characters are formed in germ-cells by certain definite

parts of the cell mechanism, sometimes visible under the microscope, called "genes." In the early days of research men talked with easy assurance of how every character was formed by a certain gene or part of a gene. But lately it has been found that the process of embryo-building is by no means so simple: we now know that even a slight character may be shaped by the interaction of dozens of genes, perhaps of hundreds. Much of the theorizing about inheritance is now seen to be erroneous. So H. S. Jennings of Johns Hopkins was moved to write a little book, "Prometheus," in which he spoke strongly of the misconceptions. He is one of the most careful men in his profession.

> The characteristics of the adult are no more present in the germ-cells than are those of an automobile in the metallic ores out of which it is ultimately manufactured. . . . The characteristics that appear under training are as much inherited characters as are those appearing under other conditions.

If a college debater quoted those sentences out of context, his audience would suppose that Jennings is disputing the whole world of biologists. But actually he is doing nothing of the sort. He is engaged in an abstruse argument about the way biologists use certain terms, and he has gone so far in stressing a point for experts that he misleads a non-technical reader. He himself foresaw that he would be misunderstood and tried to avoid the danger by saying in a footnote:

> Nothing in the text relates to the effect of education on the descendants of the educated person.

And that effect is all that concerns us in this article. The quotations from Jennings are typical of how a line of sound reasoning may be perverted, and so deceive us, when a bit of it is cited in another line of reasoning.

3. A very influential writer on heredity is Raymond Pearl, also of Johns Hopkins. He contributed to the *Mercury* for November, 1927, a slashing article about the fallacies that are making eugenics absurd. It was a wholesome article that will do a lot of good. At one point he remarked fiercely:

> Heredity does *not* mean that like produces like.

If any competent biologist reads the whole article and gets Pearl's drift, he might not object to the extreme statement. But if it were used, out of context, by a debater, it would appear to say that the children of lunatics are just as likely to have good minds as the children of sensible and intellectual people.

Be wary when you hear any such extravagant statement which seems to bowl over the foundation facts of heredity. One admirer of both Pearl and Jennings has said of their popular essays, "These are insidious because they mislead the general reader." The foundation facts of heredity are not altered every time a cytologist tries to true up the tricky uses of technical terms. The facts still stand as the basis of biology after all the assaults of the last thirty years. They were admirably summed up by G. Kingsley Noble, a curator of the American Museum, the man who exposed the fraud in Kammerer's experiments. He wrote for *Natural History*:

> Heredity gives an animal more potential characters than can ever develop. Environment determines which of these shall appear, but it cannot produce characters which are not provided for by heredity. The actual inheritance of an animal is thus ultimately dependent on the original complement of genes. . . . All inheritable adaptations have arisen independent of the environment.

There is not yet any proof that the human animal can produce characters which are not provided for by heredity. He cannot, by any sort of education, create new genes in his sperms or eggs. A child cannot inherit any training—good or bad—of a parent's body or mind. It can inherit only what is provided in germ-cells.

Does the judgment of science seem pessimistic to you? It is just the contrary. As for environment, its importance is not diminished; an improved environment can be a blessing to each succeeding generation without being put into germ-cells. And as for not inheriting good training, think of the other side of the matter. Think of how children are safeguarded by not being able to inherit the bad training. If we sentimental human beings could change the process of inheritance, and if we made the follies of parents inheritable, the human race would soon die.

Life, Love and Civilization

By GEORGE A. DORSEY

SEX came into life about fifty million years ago. It brought Love and led to the peacock and civilization.

Life is older than sex. The love to live is the older passion—so strong that man invented religions to rob death of its sting and the grave of its victory. But man's love for woman is a passion second only, if at all, to that of man's love for life.

This must be so. Sex is nature's device to make life richer, more economical, more enduring, and less the sport of chance. Having built sex into bodies and having charged sex with carrying on, nature has to see to it that sex does its work. From nature's point of view, mating is as important as living—not to mate is death to the stream of life. As long as the stream renews itself, life flows on; without renewal, the stream runs dry.

Or, look at it this way. Lowest organisms carry on by mere division—one body becomes two, two become four. One bacterium in a few hours produces billions, each potentially immortal. But mere division limits diversity—the "offspring" are all alike; there is little chance for heredity to work improvements, and the whole body has to stop its work to become two. Sex is the device to get around these limitations. It worked wonders—it opened up new worlds of life; but it had to work, for the burden of handing life on was taken from division and put on multiplication. Sex had become the bearer of immortal life on earth.

Whereas nature once said: Eat and divide; she now said: Eat, drink, and be married!

Rape is no more a crime in nature's eyes than stealing a loaf of bread; both spring from primordial hunger. Fortunately, rape is rarely necessary. Civilization cannot choke the life out of nature—nor breed a race of celibates or of vestal virgins.

Nature did not stint the endowment of either sex. The lion may have more mane and a louder roar, but when it comes to a journey for a mate the lioness is the faster traveler. The female rat will brave a danger to find a mate that only starvation pangs could make her face—and she will face it sooner than the male.

Lions and rats are uncivilized. So are we all at birth. We cannot walk, we cannot talk—and left to ourselves would perish. Our hands can support our body, but our legs can not; our backbone is as yet fit only for a wriggle. Our body grows human; we learn to act like humans. Meanwhile, who nourishes us? Who bore us?

The male bird wears the fine feathers. In civilization he provides them—and wears them vicariously. This requires energy and strategy.

Civilization is, of course, more than all this. It is the accumulated deeds done to make life secure and the prayers uttered to make life everlasting. It is also the heaped-up spoils man has laid at the feet of woman and hung on the walls of his home.

Though life is older than love, they pooled their forces eons ago and have been partners ever since. They are as potent today as ever—they make up man's inheritance, they furnish the drive to civilization.

EVOLUTION

A Journal of Nature
To combat bigotry and superstition and develop the open mind by popularizing natural science

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NUMBER 3 FEBRUARY, 1928

DARWIN WAS RIGHT

On this anniversary of Charles Darwin's birthday let us bring to the attention of our neighbors the verdict rendered on Darwin's work by the recent Congress of the British Association for the Advancement of Science through its President, Sir Arthur Keith.

After summing up in masterful fashion the unanimous evidence from a dozen fields of science, based on half a century of painstaking investigation, he concludes:

"Was Darwin right when he said that man, under the action of biological forces which can be observed and measured, has been raised from a place among anthropoid apes to that which he now occupies? The answer is YES. And in returning this verdict I speak but as foreman of the jury—a jury which has been empaneled from men who have devoted a lifetime to weighing the evidence."

The efforts of fundamentalist fanatics will prove futile. As the human race develops and progresses Charles Darwin will be honored more and more as *the great emancipator of the human intellect.*

NASHVILLE

Our hope that from the convention of the American Association for the Advancement of Science, held recently at Nashville, Tennessee, there would come a courageous call to action to rally the friends of academic freedom against the fundamentalist reaction was not realized. The leaders of the organization seem to feel that by shutting their eyes to the danger it will disappear.

However, at this Nashville convention a number of very notable contributions were made to the evolution literature. These will be reviewed in our next issue.

THERE ARE OTHERS WHO CAN'T TELL

By JOHN M. WORK

I NOTICE that Edwin Tenney Brewster wants S. Parkes Cadman to tell when the soul entered into man.

I should like to ask Mr. Brewster how evolution got started; also when and how life entered into matter.

There are multitudes of things which nobody knows. I believe in evolution, and I can ask Mr. Brewster as many unanswerable questions as he can ask Mr. Cadman.

The present existence of the soul is as evident as the existence of the body. Whether or not the soul is immortal is a disputed question, but there is nothing in evolution which precludes its immortality, and many great thinkers—scientists and otherwise—believe it to be immortal.

In short, this is just another way of saying that I do not see any good reason why different believers in evolution should attack one another's views upon extraneous questions in your periodical; but if you are going to let evolutionists of one type of religious or anti-religious views attack and ridicule the others, then I take it that you will let the others make reply in your columns too.

ONCE MORE WE SAY IT

In view of the mountainous mass of manuscripts received it is necessary to re-state our policy:

"EVOLUTION will be non-political, so that all upholders of academic freedom can support and use it no matter how they differ on other sissues. It will be non-religious, never making any effort to reconcile science with religion. Nor will it make atheism its mission. It will carry the positive message of facts from every field of natural science and leave it to the reader to make his own mental re-adjustment."

Articles "proving evolution by the bible" or claiming that the bible is bunk, or that "properly interpreted" the story of Genesis and modern science agree, or that every scientist must be an atheist, are alike foreign to the purpose of EVOLUTION.

EVOLUTION is to tell in popular language what scientists have discovered about the processes of nature.

We welcome articles: 1. Containing specific proofs of evolution. 2. Championing the right of the schools to teach whatever science has discovered. 3. Scientific news items. 4. News regarding the struggle with the fundamentalists.

EVOLUTION DINNER

The First Annual EVOLUTION Dinner has now been set for Monday evening, March 19th. This will give an opportunity for the writers, supporters and readers of EVOLUTION to get acquainted. Details in our next issue.

INFINITY AT BAY

By ERNEST UNTERMANN

SCIENTISTS make great efforts to refute fundamentalist illusions by evidences of evolution in skeletons, tissues, organs, limbs, teeth, skulls, vestiges of primitivism in embryos, and the like.

Such proofs impress only people who can use their brains freely. A regular fundamentalist suffers from brain paralysis due to the malignant growth of a complex which believes in god, free will and immortality.

This complex is not cured by mere scientific argument or evidence. Hallucinations of belief defy science and decline proof. A believer always says: Just because my faith cannot prove its divinity, it must be believed.

This is a case for the doctor, not for the lecturer. Kant said long ago: Even if god, free will and immortality cannot be proved by science, they should be believed for moral reasons.

This may not impress a savage who makes his own idols by hand and smashes them when they don't deliver the goods. But it works every time with the believer in an immaterial, supernatural, invisible, personal or diffused god.

The scientist may ask: Why should I have to prove anything to a fellow who refuses to analyze his own belief by reason, and why should not a fundamentalist be required to justify his belief by reasoned proofs instead of mere assertion? But the fundamentalist will reply: Belief is inspired, not acquired.

The scientist may counter: You can't believe without your brain. Will that shock the fundamentalist into reason? Not a bit. He will retort: My soul is not in any way attached to my brain. No matter what my brain thinks, my soul knows god in ways independent of natural law.

Now the scientist proves that any change in normal brain tissue and function by accident or disease makes all reasoning abnormal, and that all personality or soul is wiped out when the brain is wrecked. Does the fundamentalist feel that this hits him in the bull's eye?

Why should it? Prove to him that his brain with every idea in it, including his god complex, is a natural product of evolution, and he will still cut your science into shreds with a knife that has neither blade nor handle. He believes that his soul can think of god, free will and immortality even after his whole body is dust, the earth wiped out, the sun, moon and stars reduced to broken atoms, and the universe a black void. He is face to face with his god even then, a hundred per cent. fundamentalist of twentieth century coinage in a state of pure inspiration, nothing up against nothing, the infinite at bay against It.

What Caused Noah's Flood?

By DR. J. LEON WILLIAMS

In a discussion on evolution which took place in New York between the Rev. Dr. Straton, Fundamentalist leader, and Rev. Mr. Potter, the latter was evidently surprised and somewhat discomfited by a very adroit manoeuvre on the part of Dr. Straton during his speech.

He said that an eminent scientist, a "professor in one of the great institutions of learning in Nebraska," had written a book called "The New Geology" which sent all previous works on the subject and the theory of evolution into the lumber-room of discarded things. Mr. Potter was unable to make any reply to this and, in the opinion of the judges, he lost the debate. The morning after the discussion I visited several of the largest bookstores in New York in the effort to procure this wonderful new work on geology. But no one consulted had even heard of it. But it really was in existence, and I eventually secured the intellectual treasure. The *eminent scientist* from the *great institution of learning* turned out to be a teacher in a small sectarian college. I found that the author had taken his stand squarely on the Bible story of the Flood (or, at least, this was what he pretended) and the cause of the Food as the explanation of the more important geological changes on the surface of the earth. But, appreciating the difficulties of the Bible account of the causes of the Deluge, the author of "The New Geology" has apparently invented a theory of his own. He surmises that a huge meteorite or asteroid, or something of like character, came from somewhere in space and struck the earth and gave it such a shock that it set it badly wobbling and changed the inclination of its axis.

But we will let Mr. Price tell his story in his own words. He says that "the hypothesis of a world catastrophe deals with the world as a whole, that is, it deals with the world in its planetary aspects; and therefore this catastrophe must have been of an astronomical character. . . But the only astronomical cause which we can readily imagine as competent to bring about such results would be something of the nature of *a jar or shock from the outside*, which would produce an abnormal tidal action, resulting in great tidal waves sweeping twice daily around the earth from east to west, this wave traveling 1,000 miles an hour at the equator." And then, after mentioning the "inconceivable amount of geological work" which this shock would produce, Mr. Price adds this: "In the meantime, the surface of the earth would be shattered and dislocated beyond all description; and twice each day, the oceans would sweep a mighty tidal wave around the world, attaining a maximum, every 150 days, of about six miles in height at the equator." Accompanying the event were "storms such as the world has never since witnessed."

There is not a single item in this theory of the cause of the Deluge which corresponds to the account given in the Bible, and yet these Fundamentalist sticklers for a rigid adherence to the literal words of the Bible, as all divinely inspired, welcome, with every evidence of great joy, this new and purely imaginary theory of the cause of the Flood. The followers of Mr. Bryan are never weary of heaping scorn on what they call the "theories", "hypotheses" and "guesses" of evolution, but they will swallow whole, without a wince, an insane absurdity like this, for which there is not the slightest trace of evidence and in face of the fact that it contradicts the Bible story in every particular.

Of course, no geologist of reputation will waste his time in any detailed attention to this travesty of science called "The New Geology." But I may permit myself one comment. When we contemplate the spectacle of Noah guiding that box without sail or rudder, through the most awful storms the world has ever known, climbing those mountainous waves six miles high and running 1,000 miles an hour, I am lost in admiration for the most consummate seamanship that has ever been exhibited in the history of navigation. Truly, there were sailors in those days!

CONGRATULATIONS

SIR ARTHUR KEITH

whose ringing declaration for Darwinism as President of the British Association for the Advancement of Science at the recent congress in Leeds was heard around the world, sends us the following:-

Telegraphic address: "SPIRITS HOLB LONDON" Telephone: 4699 HOLBORN.

Royal College of Surgeons of England.
Lincoln's Inn Fields.
London, W.C.

3rd January, 1928.

My dear Sir,

May I congratulate you on the outstanding merits of the first number of "Evolution?" With a galaxy of talent, which comprises Starr Jordan, W.K.Gregory, Henshaw Ward, A.G.Ingalls, Maynard Shipley and many other men who are recognised in all lands as leaders of thought, it could not be otherwise. I wish your venture, which is a missionary enterprise of the highest importance, every success. What effort deserves better than that which leads men and women to seek the truth - be the cost what it may.

In your first number you have laid hold of the one essential:- we must have liberty to pursue the truth. Beyond doubt there is with us as with you men so little with science and its ways that they would willingly resort to the old methods of the Spanish Inquisition for its suppression. For my part we have to fight not with arguments begotten of emotion, prejudice and passion - but just the still small voice of truth telling how and why we have searched the world of life and what we have found there.

You might send copies of "Evolution" to the Editor of Nature and to the Editor of the Lancet - both in London, enclosing a note to them to the effect that I would be glad to write short notices for their papers so that your journal may become known in England.

With very best wishes,

Believe me

Yours sincerely,

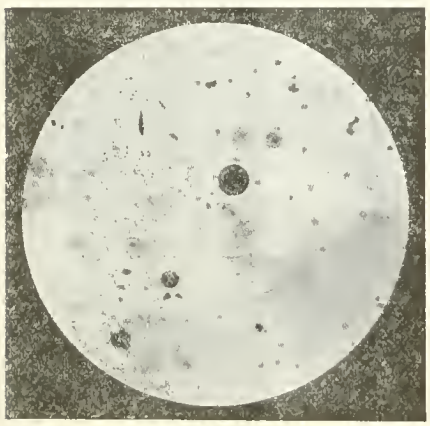
Arthur Keith

How Old Is the World?

THE EVIDENCE FROM RADIO-ACTIVITY

By ALLAN STRONG BROMS

IN the last few years a very reliable test of the age of the earth has been found in the breakdown of the radioactive elements uranium and thorium into ordinary lead. We can measure the rates of breakdown in our laboratories by counting the number of helium atoms released in the process. The rates prove to be so very slow that one-half of a particle of thorium needs five billion years to "transmute"



into lead, while one-half of a particle of uranium takes even longer, about thirteen billion years. To transmute one-half of the remaining particle takes another five or thirteen billion years, and so on indefinitely. These rates are unchanging, for heat, cold, pressure, electricity, anything we can do, seem to have no effect.

The elements uranium and thorium are found in small quantities in rocks of various geologic ages and if we can only determine how long they have been breaking down since they were included in those rocks, we will know just how old the rocks are. This very thing has been done by a number of scientists, among whom Professors Soddy and Joly are conspicuous. It has been done in three quite independent ways, with results fairly in agreement.

Uranium is the heaviest of the elements, its atom weighing about 238 times as much as that of hydrogen, its atomic weight being therefore 238. It breaks down by a series of steps, at certain of which it gives off helium atoms (atomic weight 4) and thus loses weight until it winds up as a kind of lead having an atomic weight of 206. Thorium, which starts with an atomic weight of 232, also breaks down by steps, loses helium atoms and weight and ends as another kind of lead of atomic weight 208. Our ordinary lead, which weighs about 207, is a mixture of these two pure kinds.

THE URANIUM-LEAD RATIO

If a mineral is found to contain uranium (but no thorium) and lead of atomic weight 206, we need only measure their relative amounts, apply a simple mathematical formula and learn how long the uranium must have been breaking down to produce that certain proportion of lead. The longer the time, the more lead there will be and the less uranium. Many investigators, analysing rocks from widely separated parts of the earth's surface, have independently reached results remarkably close, the ages for the oldest known rocks ranging from one to one and a half billion years. The overlying, hence younger, rocks always show a lower proportion of lead, a very convincing test of the method.

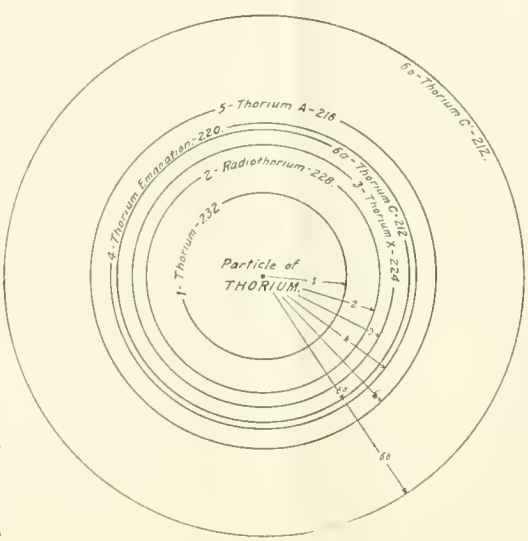
Of course, the thorium-lead ratio can be used instead. The ages indicated are generally less, but the fundamentalist will find no consolation in this, for they still run into the hundreds of millions.

THE URANIUM-HELIUM RATIO

In breaking down to lead, the uranium atom gives off eight helium atoms and the thorium atom gives off six. If we measure the relative amounts of uranium (or thorium) and helium, we ought again to be able to fix roughly the ages of the rocks. But as helium is a gas and likely to be lost from any but the most solid rocks, the results should be somewhat smaller and so we find they are.

DISCOLORATION HALOES

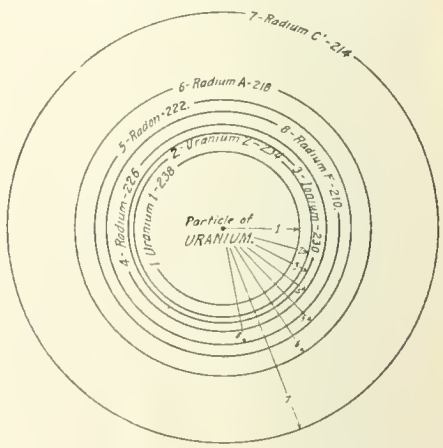
Professor Joly has made much use of a third method depending on the fact that a particle of uranium or thorium embedded in certain colored micas will slowly discolor the nearby mineral matter, producing minute spherical shells of discoloration. When viewed in cross-section, these



appear as concentric rings or haloes. They are produced by the helium atoms shot out at the several steps of radioactive breakdown. As they are shot out at differing (yet definite) speeds at each of the several steps, they travel to different distances and thus produce clearly defined rings.

In the diagrams, these various penetration distances are shown for the helium atoms from both uranium and thorium. Each step in the breakdown is given its consecutive number, each disintegration product is named and its atomic weight given. Obviously, the high speed helium atoms from Radium C' and Thorium C', as they get no help from their brother atoms, can discolor the outer rim of the haloes but faintly. In the microphotograph of the thorium haloes, this outer shell is clear.

Note also in the diagrams that the helium atoms from thorium penetrate further



and produce larger haloes. The largest uranium halo is only one four-hundredth of an inch in diameter, while that from thorium is one three-hundredth. The sizes therefore identify the parent radioactive substances, and the degrees of discoloration measure the ages of the surrounding mineral. Some of the oldest show very clearly the effects of "over-exposure," just like a photographic plate. Joly found that the younger a rock was geologically, the less discoloration there was. His estimates of rock ages based on this method involve hundreds of millions of years.

The three methods of fixing geologic ages from radio-activity agree too closely in their results to leave any serious doubts as to the enormous age of the earth crust. And before the earth crust—who knows how many billions of years must have passed? Certainly the fundamentalists' six thousand years are as impossible as the rest of their absurd notions.

NEXT: Some more on radioactivity and its part in the evolution of the earth.

FUNNYMENTALS

"In its conception, development and application evolution is utterly false, as false to science as to Scripture; and so Scripture and this unproven and unprovable hypothesis can never speak together. Truth is the embodiment of intolerance. It cannot be forced into any fellowship with falsehood. God's word is Truth. Darwin's theory is falsehood. Between them there can be no fellowship. . . .

"If it were in my power I would take every false teacher out of every pulpit and professorship in the land. . . .

"If any philosophy was ever weighed in the balance and found wanting to such an extent that intelligent men ought to turn with loathing from the same, it is the theory of evolution; and if there is a spot on earth where this theory has rendered any profit to an individual, to society or to the State, let its advocates migrate to that spot and continue their teachings there."—Rev. W. B. Riley, in February, 1928, Christian Fundamentalist.

"Evolution is an unchristian fraud. It is a blank unproved theory unsupported in fact. It is illegal to teach it in tax-supported schools. Under the common law it is blasphemy."—Evangelist L. S. Hoover, Ithaca, Journal News, Jan. 3, 1928.

"I want the people of Mississippi to know that, as Assistant State Superintendent of Education, I believe that man was made in the image of God, his Creator, and I favor putting out of the schoolroom any man or woman teaching any other doctrine."—Knox M. Broom, A. B., quoted by American Mercury, Jan., 1927.

"I would rather my babies' eyes be gouged out at this minute than to have them taught this blatant atheism. When you teach a man that he is nothing more than an evolved animal he is going to live like a beast. When you teach a community or a nation that they are made up of animals, they are going to live like a jungle. Monkey men mean monkey morals. If evolution is not checked, it will put America into a seething pit of anarchy within ten years."—Gerald B. Winrod, "The Mark of The Beast"

"As nearly as we know it at present, the Lord's return took place between 45 and 50 years ago; and all the upset times the world has had since are simply signs that Christ is getting ready to destroy all the bad and wicked works of the devil, who has kept mankind in trouble for so many thousand years."—Int. Bible Students Association, October 5, 1927.

"The discoveries of modern science make it impossible to place any credence whatever in Darwinism. Darwinism has been almost wholly discarded by scientific men."—George McCready Price, in January, 1928, Signs of the Times.

"People give ear to an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun and the moon. But sacred scripture tells us that Joshua commanded the sun to stand still, and not the earth."—Martin Luther.

"We make bold to assert that from the beginning to the end of Genesis there is not a blunder from a scientific standpoint."—Dr. Harry Rimmer, President of the Fundamentalist Research Science Bureau.

DEBATING EVOLUTION IN NORTH CAROLINA

By HOWELL S. ENGLAND

IN the spring of 1926 Dr. T. T. Martin, National Secretary of the Anti-Evolution League of America arranged two debates with the writer in Charlotte, North Carolina, on the subject of Evolution.

The debates were very unpopular. No hall could be had in the city. When an amusement park several miles out of town was secured the local Ku Klux Klan let it be known that no atheist should ever be allowed to set foot in the state of North Carolina, much less to speak there, and that upon my arrival I would be captured, taken in charge by the hooded gentlemen, and promptly put on the next train out, possibly having received in the meantime an appropriate coat of tar and feathers.

After the American Civil Liberties Union had informed the Governor of North Carolina and the mayor of Charlotte that the constitutional right of free speech should not be abridged in their city and state, the local Klan executed a beautiful somersault and announced publicly that they would see I was protected in all my constitutional rights, and that they had five hundred men in the mountains who would come down if necessary for my protection.

So the debates took place; and if the applause that followed our points was an indication, I had as many backers in the audience as had Doctor Martin. The moderator of the first debate was a former judge of the circuit court. He was eminently fair. The moderator the second night was a fundamentalist preacher by the name of Holland who became very solicitous as to the time taken up by myself as soon as I began to make light of the account of creation and the flood in Genesis.

Holland said to me after the debate, with what was intended to be crushing severity: "Mr. England, you are the first man I have ever heard willing to admit that he did not believe the divinely inspired story of creation as given in the Bible, and it will give me great pleasure in recalling this incident to remember that the same man acknowledged he was a blood-brother to the skunk and the turkey-buzzard."

Apparently many people in the audience heard the story of evolution for the first time at these debates. One woman asked in all seriousness: "Mr. England, do you really believe that what you told us this evening is the truth?"

The people of North Carolina I found hospitable, eager to hear and to learn what the debates were about. The crying need of the state, as I see it, as well as of all the other states in the Bible belt, is modern education broadcast among all their people.

Really Bright Son—"Say, Dad! Teacher says we are descended from monkeys."

Fundamentalist Father (not so bright)—"Nonsense! You may be, but I'm not!"

SHARES AVAILABLE

The EVOLUTION PUBLISHING CORPORATION, organized under New York State laws, offers its $10.00 shares of 6% preferred stock. With every five shares of preferred one $10.00 share of common, voting stock will be given, if paid before March 20.

The immediate business is publishing this journal, EVOLUTION and selling books. Later a Lyceum Bureau for touring natural science lecturers will be developed.

Although it is expected the business will pay, share-holders are not invited on the basis of making profits, but because this work is WORTH DOING.

Additional capital furnished now will help make the circulation campaign for EVOLUTION magazine a success. Checks should be made payable to EVOLUTION PUBLISHING CORPORATION. In remitting kindly state whether payment is made in full, or whether it should be applied on a larger block of stock to be held until balance is paid.

LET US MAIL SAMPLES TO YOUR FRIENDS

Of course you'll show this issue of EVOLUTION to your friends and ask them to subscribe. But you probably know some who would be interested, whom you can not visit yourself. Send us their names and addresses and we'll mail them sample copies.

It will cost us about five cents a copy to send out these samples, so if you can send along a check to help pay for them we'll not object. However, if your bank account is minus don't let that stop you. Send us the names anyway and we'll raise the cash otherwise.

WHAT'S A HUNTER WITHOUT AMMUNITION?

A hunter without ammunition is in the same fix as an evolutionist without copies of EVOLUTION. Surely YOU don't want to remain in such a pickle. The best way out is for you to fill in appropriate characters on the following blank in a hurry.

— — — — — — — — —

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The Origin of Reptiles and Birds

By MAYNARD SHIPLEY

TOWARD the close of the Age of Amphibians extensive land elevations occurred throughout the world, draining swamps and drying up ponds and lakes. Nearly all the continents were then connected by land bridges, and cooler temperatures prevailed. There was every incentive for an extensive development of land animals. The transition from low lands to high lands being gradual, many of the Amphibia were sufficiently plastic to meet the new conditions, by slow, progressive adaptations, modifications of pre-existing structures.

It is quite possible that some fish-like form gave rise to both Amphibia and Reptilia. Be this as it may, we know that, as stated by Prof. H. F. Osborn, "the most ancient solid-headed reptilian skull type is very similar to that of the solid-headed Amphibia. Bone by bone its parts indicate a common descent from the skull type of the fringe-finned fishes."

Prof. Charles Schuchert remarks: "It is becoming increasingly difficult to distinguish the late Paleozoic reptiles from their stegocephalian associates." But the "mailed headed" or armored Amphibia are not regarded as the most primitive of land vertebrates. Evidence is rapidly accumulating. Professor Schuchert tells us, to show that the stegocephalians "arose in an older stock (*Protopoda*), which gave rise on the one hand to the water-loving amphibians, and on the other to the reptiles, which became completely adapted to the dry land."

We know that the Amphibia and Reptilia have as common ancestor a lung-breathing and gill-breathing fish, and that the Reptilia gave rise on the one hand to the lowest or egg-laying mammals and on the other to birds.

The lizard-like reptiles gave rise to two distinct types of dinosaurs, one of which, bird-like ischium, shows many structures similar to those of birds—e. g., brain, reproductive organs, pelvic bones, three toes, ankle bones united with the leg bones, etc. Feathers are but modifications of reptilian scales, with the edges frayed out. Like the scales of lizards, feathers are a development of the outer or horny layer of skin. Not only is the skeletal structure of birds essentially reptilian, but they are also much alike in their developmental history, from fertilization of the reptile-like egg to their emergence from the envelope or shell. Jurassic and Cretaceous birds possessed reptile-like teeth, and some of them had not yet lost their reptilian claws.

Fortunately, two fossil specimens of the Jurassic bird—the most primitive known—were found in a slate quarry at Solenhofen, Bavaria. It was about the size of a pigeon. So closely related to the reptiles was this genus of bird, that if the skeleton had been found minus the feathers, the comparative anatomist might reasonably have described the fossil as belonging to the Reptilia, though it possessed some distinctly bird-like characters. The first specimen found possessed a long reptilian vertebrated tail of twenty-one joints, with one pair of quill-feathers attached to each vertebra; whereas in all modern birds the feathers are arranged like the sticks of a fan, with the large feathers folding upon one another.

Archaeopteryx (Greek for ancient wing), as this bird was named, had a bird-like head and a bird-like brain; but its jaws, or beak, instead of being of horn, as in modern birds, were provided with sharp reptilian teeth. It appears that the head and neck were devoid of feathers, but the legs were equipped with quill feathers. The wing retained three fingers with reptile-like claws, and the bones of the palm (metacarpals) were free from one another. The fingers had the same number of joints as are found in lizards. The vertebrae were biconcave, as in fish and some reptiles. The breast-bone ("keel") was but slightly developed; whereas in modern birds the keel is relatively large, affording abundant room for the attachment of muscles. *Archaeopteryx* was a poor flyer, probably using its primitive wings for gliding or soaring through the air. (The *Pterodactyl*, or flying reptile, which developed quite differently, was a far better flyer than the earliest true bird.)

Here, then, we have another non-missing link, a transition stage in the evolution of dinosaur-like reptiles into birds as we know them.

EVOLUTION LOST

Evolution was put out of business in a debate held January 31st in City College, Detroit, between Dr. Newman Dorland of Chicago and Harry Rimmer of the fundamentalist Research Science Bureau. One of our readers, A. D. Latham, reports:

"Mr. Rimmer produced fossils to prove that the evidence of Paleontology contradicts the evolution theory; named so many various strata formations in California, Mexico, Alaska, Europe, etc., where the oldest is on top and the newest on the bottom or all mixed up that geological disturbance was not acceptable; said there is not a particle of biological evidence to show transmutation of species and hurled a defi at science to prove it. He spent half an hour to show how ridiculous the vestigial theory is and wound up with a peroration to the effect that science first forms an opinion and then misinterprets facts to fit that opinion.

"A vote was taken. Needless to say, anti-evolution won by a majority of 1500 against 20 for evolution."

This was not in back-woods Tennessee, but in a metropolitan community of the "intelligent" North. Those evolutionists who think that Darwinism is already universally accepted and that there is no need for a publication such as this will have a rude awakening some of these days.

"TENNESSEE"

— or —

"They Can't Make a Monkey Out of Me"

(*Fundamentalist Ditty*)

I'm from good old Tennessee,
I'm a plain out-spoken man.
I go to church on Sundays,
And do my neighbor when I can.
This world wus made in seven days,
The good book tells us so:—
If anyone doubts it, scoffs or flouts it
We all know where he'll go!!

They're tryin' to upset the his'try
Of how the world began:—
They've got a thriller
That a big goriller
Wus the ancestor of man.
Did y' ever hear such a fool idee?
It seems unfair to me:—
For my face is pale and I've got no tail,
And I've never climbed a tree!!

Refrain

Oh! the things they do
And the things they say
Won't go in Tennessee!
They can shout, they can hoot
They can evolute
In some other state maybe.
When they say I come from monkeydom
They insult my family tree!!
They can teach, they can preach,
They can get up an' screech,
But not in Tennessee;
An' I'm goin' to shout
'Til I drive 'em out,
For they can't make a monkey out o' me!!

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DEBATE IN NEW ORLEANS

W. B. Riley of the World's Christian Fundamentals Association and Charles Smith of the American Association for the Advancement of Atheism will debate under the auspices of Delta Gamma Sigma Lecture Bureau in Jerusalem Temple, St. Charles Ave. and Clio Street, New Orleans, March 14th and 15th.

The question for the first evening is: "Is Evolution a Fake Philosophy?" The second: "Should Evolution Be Taught as An Established Science in Tax Supported Schools?"

Readers having open minded friends in New Orleans will confer a favor by sending us their names and addresses so that we may mail them sample copies of EVOLUTION in advance of this debate.

SLOW EVOLUTION VERSUS FAST EVOLUTION

By ALBERT DUY MCNAIR

THE Darwinian theory of evolution assumes that scores of millions of years and perhaps hundreds of millions of years have been consumed in the process of evolution from the lowest forms of life to the highest. As far as man, himself, is concerned, evolutionists believe that a million years, more or less, have passed since man became really man.

Those who object to this theory of evolution on biblical grounds, say that they do not believe in evolution at all although admitting that minor changes have occurred in man, animals and plants since they were first created. They admit that there are many varieties of the human species, of cattle, dogs, deer, oak trees, pine trees, clovers, etc., and they admit that these varieties have taken place by certain natural processes.

In taking the Bible as their standard of authority on this matter of the variation of animals and plants they are also committed to other consequences of the biblical story. If the biblical story of the Flood has any real historical meaning, it means that all species of land animals and plants that are on the earth today have descended from the pairs that were preserved in the ark about 4000 years ago.

Also the biblical story that snakes were made to go on their bellies after the serpent tempted Eve, involves the idea that they did not go on their bellies previous to that time, and involves the further conclusion that all present snakes, including the poisonous and non-poisonous kinds, have grown their differences in 6000 years.

In regard to other animals, if we classify them as "lumpers" instead of "splitters"; if we make the number of species so few that the ark could have held them, then we make the variations in 4000 years such as would, according to the real evolution theory, require millions of years.

It follows from the foregoing that those who object to the theory of evolution on biblical grounds really believe in a more rapid change in animals and plants than do the Darwinian evolutionists. They may call this change by the name of variation or development or something else, but it is evolution just the same.

Has any one seen Negro children or Esquimaux children born from white parents, or white children born from Negro or Esquimaux parents? The differences between these races must have come about by some process of change, development, or evolution, or call it what you will. How long has it taken for these differences to develop? According to the evolutionists it has taken hundreds of thousands of years. In the case of whites and negroes it may have taken a million years. According to the opponents of evolution, it has all come in 4000 years.

It comes, then, to this: The Darwinian evolutionists believe in slow evolution, their opponents believe in fast evolution.

CHARLES DARWIN: THE MAN AND HIS WARFARE. *By Henshaw Ward.* Bobbs-Merrill Co.: $5.00.

It was decidedly appropriate that Henshaw Ward should write the story of the Father of Evolution, for his "Evolution for John Doe" placed him securely near the top of the list of those who can make this subject interesting and understandable for the mythical man in the street; and, as was to be expected, he has here given us now not merely a readable biography but a human document that presents its subject as a real, living character—simple, lovable, painstaking, but always the scientist.

If only those who prate about evolution as a guess could be induced to read this story of a man's patient investigation, careful study, and cautious judgment, to say nothing of his physical handicaps, they would certainly be shamed into silence. How ridiculous their puny ravings in the light of Darwin's ceaseless devotion to scientific truth!

Darwin's procedure, says Ward, was to ask, "What do you make of these facts that I observe?" And he observed for an ordinary life-time before venturing to a conclusion. Here we have the account of his travels, interesting and romantic as a novel, the introduction to his long search for facts; and then we are shown how his ideas correlated with the events of his life.

There have been many erroneous statements about Darwin and his conclusions, and many misconceptions. One was the notion that he changed his mind and came to accept the Lamarckian philosophy. Mr. Ward pays his respect to those responsible for the spreading of such errors, including Dr. H. F. Osborn. With fine discrimination and accuracy of judgment and language the author examines the facts available and reaches apparently rational conclusions on all these disputed points.

Not the least interesting part of the book is that which relates how the "Origin of Species" was received, how the conservatives gathered for the onslaught under "Soapy Sam," the Bishop of London, and how they were met in the arena by Huxley. Ward says, "The hurricane of wrathful hypocrisy that burst upon Darwin in December, 1859, is perhaps the most simian exhibition that the human race ever made of itself."

Needless to say, this is a book that is recommended without reservation for the readers of this publication.

HARRY HIBSCHMAN.

PLEASE RETURN UNSOLD COPIES

Again so many re-orders were received for the second issue of EVOLUTION that we have none left. We shall appreciate very much the return of all unsold copies.

The honors for greatest sale this month go to the Little Blue Bookshop, 3441 Woodward Ave., Detroit, with 150 copies.

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I keep six honest serving-men
(They taught me all I know)
Their names are *What* and *Why* and *When*
And *How* and *Where* and *Who*.
Rudyard Kipling, "Just So Stories"

SOME GOOD BOOKS

EVERY reader of EVOLUTION is *of course* also a reader of books. We recommend the following in their respective fields.

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"If some of you provincial ignoramuses in New York would ever come out into the middle west and meet a few red-blooded, patriotic, straight-and clean-thinking Americans, you would soon learn that these same "ignoramuses of the bible belt" are the backbone of America. And that hundreds of men west of Pittsburgh whose names glow in letters of fire in the Pantheon of Science are also men who revere an omnipotent God and confess His Son as the One whose sublime sacrifice on Calvary redeemed a world.

"Certain scientists" have developed a curious and laughable atheistic complex, whereby the fruits of scientific research have turned to wormwood and Dead Sea apples in their mouths. A large proportion of the criminality among the youth of America today is directly chargeable to vicious and irresponsible atheists in American colleges who pervert the doctrine of Evolution into a dogma of bestialism, destroying in the student mind the sense of accountability to a supreme Power."—Donald P. Beard, Missouri.

"Herewith find check for $50.00 for broadcasting EVOLUTION. Use it as you see fit. But on bended knees I beg you, if you can, do something for poor old Fundamentalist, Klan-ridden Indina. It is not one jump ahead of Tennessee. The darkest of the northern states.

"I live in a hick town where the bible is taught in the schools and where the superintendent of schools never missed a meeting of the woman's weekday prayer meeting. He would not allow Wells' Outline of History in the schools because it taught evolution. He could name on his fingers all the books he would not destroy if he had the power. And he was respected. Doctors "eat the flesh and drink the blood' of a dead god and the only lawyer teaches a Sunday school class.

"What can one poor devil of an evolutionist do? To poke your head above the dead level is to get batted. I poked. I know.

"Best wishes for EVOLUTION. Yours for Humanity,"—M. Mark, Indiana.

"I am delighted with this undertaking. In conversation with Dr. Gregory two or three years ago I stressed the importance of such a step and pointed out the folly of underestimating the strength and influence of Fundamentalists."—J. Leon Williams, New York.

"The magazine EVOLUTION has just reached me. I must congratulate you upon its matter and get-up. Its timeliness should ensure it a long and prosperous life."—Hugh F. Munro, Pennsylvania.

"Why wasn't such a magazine started long ago? Send me 20 copies quick and the crop returned to you will be abundant."—Wm. George Henry, California.

"Just received sample. It looks like the stuff. Here's check for two dollars. More power to you."—G. M. Morris, Ohio.

"Please do not send me any more of this disgusting literature."—B. S. L. Davis, Maryland.

"Judging by the sample copy you have been good enough to send me, I am in hopes the periodical will be of great assistance both to laity as well as clergy."—Leslie E. Goodwin, Maryland.

"Good luck to you. More power to your elbow."—Hutton Webster, Nebraska.

"Here are some more—five one-year subscriptions, $2.50. It's surprising the fundamentalists one meets in high places in our ranks."—P. B. Cowdery, California.

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"You are going strong. Look out for the *weak-kneed evolutionists*." — Frank Hart, Pennsylvania.

"Please send copy of Number I of EVOLUTION again. I gave it to a good Christian and he never returned it. Wish you great success."—Tobias Sigel, Mich.

"It is high time that a magazine of this kind is published and widely circulated. May it prosper and become a formidable factor in combatting all the falsehood and bigotry which infest the people. Here's check for $2.50 for five."—John Kramarich, Minnesota.

"Hope you get a few million more subscribers. Good luck."—Paul L. Knorr, Pennsylvania.

"I am not alone in this feeling, for I have received letters and telephone calls asking whether I have read your publication and expressing delight with it. Enclose $4 for five subscriptions for your needed magazine."—J. DeRose, New York.

"Will do everyting in my power to help spread this splendid mind developer."—David J. Zimmerman, California.

"You are a dirty, black, hell-bound outfit. You'll cry for the Rocks and the Mountains to fall on you some day. The devil have got you bound hand and foot." Unsigned letter from Jamestown, No. Dak.

"Received two issues. Read every word. Like it well. Here's a dollar for broadcasting."—Henry H. Gonor, Canada.

"My heartiest congratulations on *both* the December and January numbers of EVOLUTION. It is by far the clearest, to say nothing of the most courageous, of all the strictly scientific publications. Put us on your list for 100 copies monthly until further notice.

"And *don't* let anybody persuade you to stop 'making fun' of the fundamentalists, but just keep it up. We have a real battle on in this evolution controversy and all effective weapons must be used."—Queen Silver, California.

"I am very much interested in learning the truth about ourselves. It appears to me that our *civilized* people are under influence of false teaching. In other words, Humbug Rules the World."—Vac J. Hladky, South Dakota.

"The schools have failed to popularize Evolution. Result: the multitudes in ignorance are being preyed upon by narrow, stupid fundamentalists. I enclose copy of a lecture delivered here by Winrod, who hails from Wichita. He promises to have an anti-evolution bill in our next Kansas legislature. His delivered lecture was much worse than the printed. He defied any one to find anything on earth more than 6000 years old. He was in church, and one had no chance to interrupt or reply."—Andrew Shearer, Kansas.

"Send us 20 copies, January number. Let this be a standing order. The little newcomer is catching on quite well here."—Harper News Co., Arkansas.

"It's great. Already passed through several hands. If I knew how I would pray for your success for we surely need such publications."—N. H. Robinson, Oregon.

A. F. Conrad
Pastor's Study
Park Street Church
Boston, Massachusetts

Jan. 11, 1928.

Evolution Publishing Corpn.,
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To the Editor of "Evolution":
My dear Sir:

I was glad to see your photograph and that of one of your ancestors on the front page of "Evolution" for January. The contents of the paper are precisely what I should expect from those photographs. For dogmatic assertion and massed ignorance it would be difficult to find anything that would surpass "Evolution". I really think you are to be congratulated on being able to present something "entirely different" for I am quite sure neither on this nor the other side of the water has anything thus far been presented so entirely unique in its jungle wisdom as your paper. I wish you the largest success, for I can conceive of nothing which will so thoroughly turn people away from organic evolution, as your paper.

Very truly yours,

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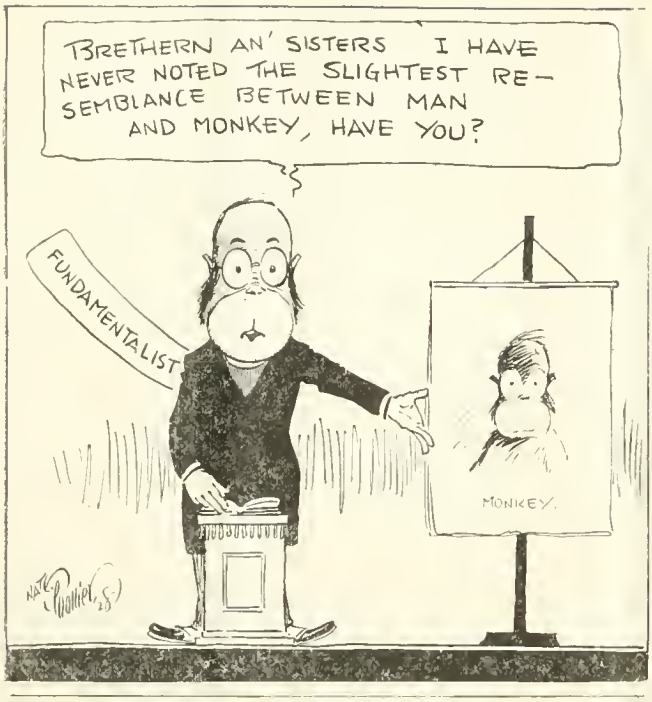
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THROTTLING THE SCHOOLS

Shipley reports that two thirds of rural schools prohibit teaching evolution. This is no accident. The September issue of the Fundamenatlist Defender explains how it is done:-

"Tax payers may play an important part by demanding of their local school boards that only those teachers be engaged who are openly and without hesitation opposed to evolution.

"Notice, I say 'openly opposed', for many people repudiate evolution with their lips when questioned, but retain mental reservations. Make sure that your money, as a tax-payer, goes only to pay the salaries of teachers who reject the beast theory in its entirety. Let there be no half-way business!

"The responsibility must rest with individual tax-payers, working through their school boards, until such time as a sufficient number of people can be awakened to the seriousness of the situation and demand action on the part of legislative bodies."

WHAT WILL YOU DO

about this effort of fundamentalism to throttle the teaching of science? Here is a convenient blank on which to make appropriate answer.

IN THIS ISSUE:

ALLAN STRONG BROMS: Formerly Science Lecturer, Twin Cities Workers University Society.

GEORGE A. DORSEY: Author "Why We Behave Like Human Beings" and "The Nature of Man".

HOWELL S. ENGLAND: Pres. Michigan Rationalist Assn.

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BERNHARD J. STERN: U. of Washington. Author, "Social Factors in Medical Progress".

ERNEST UNTERMANN: Edit. Dep't, Milwaukee Leader.

J. C. TH. UPHOF: Head Dep't Biology, Rollins College.

HENSHAW WARD: Author, "Evolution for John Doe", "Darwin, The Man and His Warfare", etc.

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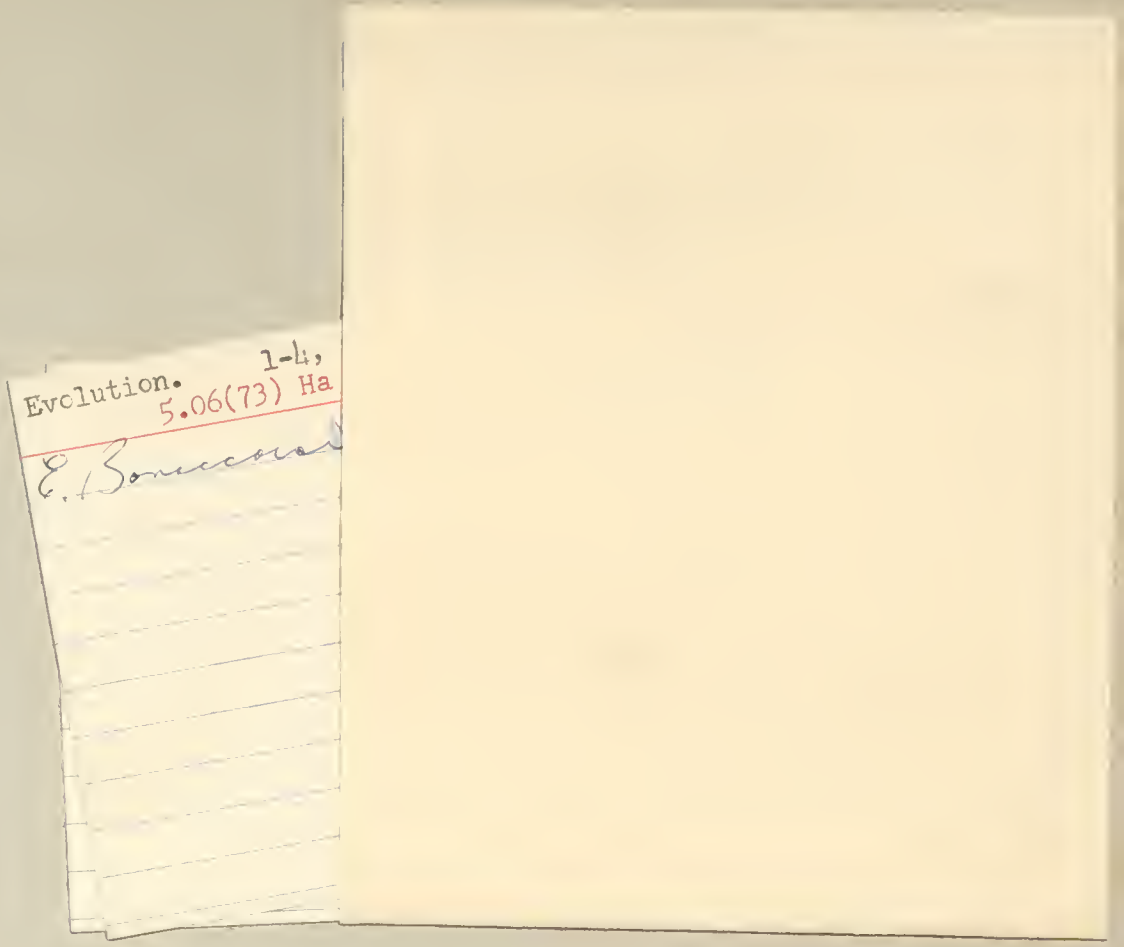

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